

REMARKS

Claims 42-57, 70-74 and 90-92 are pending. By this Amendment, claims 58-63, 69 and 87-89 are canceled. No new matter is added.

This Amendment should be entered after final rejection because it does not raise any new issues in that it only cancels claims.

I. No Potential Interference

Although this application and its parent application originally included claims copied from U.S. Patent No. 5,305,054, all pending claims of this application are patentably distinct from the claims of U.S. Patent No. 5,305,054, because all remaining independent claims recite "by a shaping optical system including at least a movable optical element and an exchangeable optical element", which is not present in the claims of U.S. Patent No. 5,305,054. Thus, Applicant is not seeking an interference in the present application.

II. Rejection Under 35 U.S.C. §112, First Paragraph

Claims 42-63, 69-74 and 87-92 stand rejected under 35 U.S.C. §112, first paragraph. This rejection is moot with respect to the canceled claims and is respectfully traversed with respect to the remaining claims.

The Office Action asserts that "there appears to be no basis in the original disclosure for the method for imaging a fine pattern having linear features extending in orthogonal first and second directions and a method for providing a light source having decreased intensity portions at a center thereof and on first and second axes defined to intersect with each other at the center and defined along the first and second directions respectively." The Office Action further states "the Examiner does not find where the original disclosure describes forming an image with linear features extending in orthogonal first and second directions." The Office Action then goes on to discuss the points P arranged along line segments L, and asserts that such points "do not make linear features." The Office Action also asserts that the original

disclosure does not "specifically state that the light source has a decreased intensity portions [sic] at a center thereof and on first and second axes defined to intersect with each other at the center and defined along the first and second directions."

Applicant respectfully submits that the original disclosure provides abundant disclosure of, and support for, the features recited in Applicant's claims.

The pattern "having linear features" referenced in most of the claims is the pattern, for example, of a mask or reticle that is exposed onto an object. Paragraph [0004] of Applicant's substitute specification explains that reticle patterns typically include opaque lines in the X and/or Y directions. Fig. 15a shows a one-dimensional line-and-space reticle pattern. See paragraph [0127]. The first sentence in paragraph [0058] indicates that the reticle pattern has a line width. The last sentence in paragraph [0068] indicates that the reticle has a line-and-space ratio. Thus, Applicant's drawings clearly show linear features extending in one direction, and Applicant's specification (for example, paragraph [0004]) clearly describes that reticle patterns sometimes have opaque lines in the X and/or Y directions. Accordingly, Applicant respectfully submits that the specification describes patterns having linear features (i.e., opaque lines) extending in orthogonal first and second directions (in the directions of the X and Y axes).

With respect to positioning of the higher light intensity portions relative to those line patterns, as previously explained, in Fig. 15D four high intensity light regions are defined at locations P. Those locations are in four different quadrants defined by the X and Y axes also shown in Fig. 15D. The X and Y axes intersect at the center point C, which corresponds to the optical axis AX of the illumination system. See, for example, paragraphs [0123] - [0132]. Fig. 13 also shows four high intensity light areas 35a-35d positioned in the four quadrants. This structure results in lower light intensity areas at the center portion (point C corresponding to the

optical axis AX) and along the X and Y orthogonal axes because the light sources are spaced away from those locations.

Accordingly, Applicant respectfully submits that the written description requirement of 35 U.S.C. §112, first paragraph, has been satisfied. Withdrawal of the rejection is requested.

Moreover, Applicant notes that claim 72, which is included in this rejection, does not even recite first and second orthogonal directions.

III. All Pending Claims Are Patentable

Claims 42-63, 69-74 and 87-92 stand rejected under 35 U.S.C. §103(a) over JP-A-61-91662 (Horiuchi et al.) in view of U.S. Patent No. 4,947,413 (Jewell et al.), and further in view of either U.S. Patent No. 4,153,336 (Minami et al.) or U.S. Patent No. 4,871,257 (Suzuki et al.). These rejections are moot with respect to the canceled claims and are respectfully traversed with respect to the remaining claims.

Applicant respectfully submits that there would have been no motivation to combine the references to result in the features recited in Applicant's independent claims. Rather than considering the teachings of each reference as a whole, the Examiner picks and chooses certain features from Minami et al. or Suzuki et al., and then modifies Horiuchi et al. with those features, even though one skilled in the art would not have been motivated to modify the Horiuchi et al. system with the selected features from Minami et al. and Suzuki et al. because those features are taught to provide a function completely at odds with the goals of Horiuchi et al.

Horiuchi et al. discloses providing annular illumination. One way that Horiuchi et al. provides the annular illumination is to provide a plurality of apertures in a ring formation. See, for example, Fig. 3 of Horiuchi et al. The plurality of apertures are provided (instead of a continuous open ring) merely to provide a mechanical connection between the inner light blocking portion and the outer light blocking portion. Horiuchi et al. provides no teaching

that the apertures (or the light blocking portions between the apertures) should be located in any particular relationship to the direction(s) in which features of the reticle pattern extend.

The Office Action, in order to read Horiuchi et al. on Applicant's claims, randomly draws one axis "22 degrees from the horizontal" and then a second axis orthogonal to that first randomly-selected axis. The Office Action, however, recognizes that even with such randomly drawn axes in Horiuchi et al., there still is no teaching that those axes should extend in the directions of the linear feature(s) of the pattern. The Office Action then asserts that such a relationship between the apertures in Horiuchi et al. and the directions in which the linear features of the pattern extend would have been obvious in view of Minami et al. or Suzuki et al. Applicant respectfully disagrees.

Minami et al. discloses a device for detecting defects in a pattern contained, for example, on a photomask. The photomask includes "a normal pattern" of linear components and "defects" composed of non-linear components. See col. 1, lines 37-40. As taught throughout the Minami et al. disclosure, Minami et al. provides spatial filter 16 having the various light-blocking structures arranged relative to the linear components on the photomask so that images of the linear components are blocked or reduced, thereby enabling the defects to be more readily observed on the screen 17. See, for example, col. 3, lines 5-13 of Minami et al.

Minami et al. provides no motivation to one having ordinary skill in the art to arrange the apertures of Horiuchi et al. in any particular relationship to the features of the pattern. The exposure apparatus of Horiuchi et al. forms images of the reticle patterns onto a substrate (for example, a wafer). Horiuchi et al. is not detecting defects in any image or pattern, and would not want to block the features of the pattern. Blocking the features of the pattern is the antitheses of Horiuchi et al.'s goals. Accordingly, Applicant's independent claims would not have been obvious in view of Horiuchi et al. and Jewell et al., further in view of Minami et al.

Suzuki et al. discloses a device for observing alignment marks on an object that also includes linear patterns that define a circuit pattern. See col. 1, lines 20-39, and col. 6, lines 49-62. Because the alignment marks are lines that extend in a direction that is different from the directions in which the linear patterns extend, Suzuki et al. provides aperture plate P_C so that diffraction and reflection light of the alignment mark is selected while light from the other patterns (the linear circuit patterns) is blocked. See col. 3, lines 7-12, col. 3, lines 23-30, and col. 6, lines 3-39.

Accordingly, like Minami et al. discussed above, Suzuki et al. provides no motivation to one having ordinary skill in the art to arrange the apertures of Horiuchi et al. in any particular relationship relative to features of the pattern. The exposure apparatus of Horiuchi et al. forms images of the reticle patterns onto a substrate (for example, a wafer). Horiuchi et al. is not observing alignment marks, and would not want to block the linear patterns of the circuit pattern. Blocking the linear patterns of the circuit pattern is the antithesis of Horiuchi et al.'s goals. Accordingly, Applicant's claims are patentable over Horiuchi et al. in view of Jewell et al., and further in view of Suzuki et al. Withdrawal of the rejection is requested.

In summary, the references' combined teachings do not disclose or suggest:

- illuminating with decreased intensity portions at a center and on first and second axes defined along first and second directions of orthogonal pattern linear features as recited in independent claims 42, 47, 90 and 91;
- illuminating a pattern such that the strength of illumination in a first plane including a first direction of the pattern linear features and in a second plane including a second orthogonal direction of the pattern linear features is lower than in a third plane different from the first and second planes as recited in independent claims 52 and 55;

- illuminating a pattern with increased light intensity portions within four sections relative to first and second axes defined to intersect each other at a center and defined along first and second orthogonal directions of pattern components as recited in independent claims 70, 90 and 91;
- an increased light intensity distribution relative to and outside of a cross-like portion defined to intersect at a center and defined along first and second orthogonal directions of pattern components as recited in independent claim 71; and
- increased intensity portions relative to a portion corresponding to a path in a plane of incidence including a predetermined direction in which pattern features extend as recited in independent claim 72.

IV. Conclusion

In view of the foregoing, Applicant respectfully submits that this application is in condition for allowance. Favorable reconsideration and prompt allowance are earnestly solicited.

Should the Examiner believe anything further would be desirable to place this application in even better condition for allowance, the Examiner is invited to contact Applicant's undersigned attorney at the telephone number set forth below.

Respectfully submitted,



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MAC/ccs

Attachment:

Petition for Extension of Time

Date: August 21, 2007

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